

## CLAIMS

Having thus described the aforementioned invention, we claim:

1. An apparatus for testing and monitoring an optical network, said apparatus comprising:

5 a plurality of couplers, each said coupler tapping into an optical fiber, each of said couplers representing a channel;

at least one coupler switch in communication with said plurality of couplers;

a test switch in communication with said at least one coupler switch;

a plurality of test equipment in communication with said test switch;

10 a processor in communication with said plurality of test equipment, said processor controlling said at least one coupler switch causing said at least one coupler switch to select one of said channels, said processor controlling said test switch causing said test switch to select one of said plurality of test equipment, said processor programmed to execute a process including selecting said channel  
15 to test, selecting one of said plurality of test equipment, initiating a test, saving a result of said test, and determining and initiating a corrective action; and

at least one routing switch in said optical network, said at least one routing switch in communication with said processor, said at least one routing switch for performing said corrective action.

20 2. The apparatus of Claim 1 further including a device between said at least one coupler switch and said test switch, said device selectively modifying an intensity of an optical signal transmitted to said plurality of test equipment.

3. The apparatus of Claim 1 wherein said corrective action is selected from a group including sending a first message to a telephone, sending a first alarm to an alarm unit, sending a second alarm to a remote service, sending a second message to a remote service to request a response to a failure or risk of failure, grooming the optical network, and optically rerouting said channel.

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4. The apparatus of Claim 1 wherein said at least one routing switch has a response time of less than or equal to 10 milliseconds.

5. An apparatus for testing and monitoring an optical network, said apparatus comprising:

10 a plurality of couplers, each said coupler tapping into an optical fiber, each said coupler representing a channel;

at least one coupler switch in communication with said plurality of couplers, said at least one coupler switch having one output selected from a plurality of inputs;

15 at least one test device in communication with said at least one coupler switch;

20 a processor in communication with said at least one test device, said processor controlling said at least one coupler switch causing said at least one coupler switch to select one of said channels, said processor programmed to execute a process including selecting said channel to test, initiating a test, and saving a result of said test.

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6. The apparatus of Claim 5 further including at least one routing switch in said optical network, said at least one routing switch in communication with said processor, and said at least one routing switch for routing a first optical channel to a second optical channel.

7. The apparatus of Claim 5 further including a device between said at least one coupler switch and said at least one test device, said device selectively modifying an intensity of an optical signal transmitted to said at least one test device.

5 8. The apparatus of Claim 7 wherein said processor controls said device to selectively modify said intensity.

9. The apparatus of Claim 5 further including an optical amplifier between said at least one coupler switch and said at least one test device, said optical amplifier controlled by said processor.

10 10. The apparatus of Claim 5 further including an attenuator between said at least one coupler switch and said at least one test device, said attenuator controlled by said processor.

11. The apparatus of Claim 5 further including a test switch between said at least one coupler switch and said at least one test device wherein said at least 15 one test device includes a plurality of test equipment, said test switch selecting one of said plurality of test equipment.

12. The apparatus of Claim 11 wherein said plurality of test equipment includes at least one device selected from a group including binary error rate measurement, spectrum analysis, insertion loss, return/reflectance loss, optical 20 time domain reflectometer, chromatic dispersion, polarization mode dispersion measurement, power, and reflection.

13. The apparatus of Claim 5 wherein said processor includes determining and initiating a corrective action.

14. The apparatus of Claim 13 wherein said corrective action is selected from a group including sending a first message to a telephone, sending a first alarm to an alarm unit, sending a second alarm to a remote service, sending a second message to a remote service to request a response to a failure or risk of failure, grooming the optical network, and optically rerouting said channel.

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15. The apparatus of Claim 5 wherein each of said at least one coupler switch is an Nx1 switch, said Nx1 switch having a number of inputs switchable to one output.

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16. An apparatus for testing and monitoring an optical network, said apparatus comprising:

means for extracting a plurality of test signals from the optical network;  
means for selecting a channel for testing, said channel being selected from said plurality of test signals;

means for testing said selected channel;

15 means for evaluating a test result; and

means for performing a corrective action.

17. The apparatus of Claim 16 further including means for selectively modifying an intensity of said channel prior to testing said channel.

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18. The apparatus of Claim 16 further including means for selecting a test to perform on said selected channel;

19. At least one computer programmed to execute a process for monitoring and testing an optical network, the process comprising:

- a) determining a channel to test, said channel representing an optical signal on the optical network;
- 5 b) selecting said channel to test by sending a control signal to a coupler switch, said coupler switch communicating with a plurality of couplers, each of said couplers connected to an optical cable forming the optical network.
- c) initiating a test;
- d) saving a result of said test;
- 10 e) comparing said result to at least one threshold;
- f) determining if a corrective action is required; and
- g) initiating said corrective action.

20. The process of Claim 19 further including a step of setting an amplification level for said channel; said amplification level applied to said channel before said step of c) initiating said test.

21. The process of Claim 19 further including a step of setting an attenuation level for said channel; said amplification level applied to said channel before said step of c) initiating said test.

22. The process of Claim 19 wherein said step of a) determining said channel to test includes sequentially selecting each of said channels.

23. The process of Claim 19 further including, after said step of e) comparing said result, flagging said channel for more frequent testing.

24. The process of Claim 19 further including, before said step of c) initiating said test, selecting a test to perform on said channel.

25. The process of Claim 24 wherein said step of selecting said test includes sequentially selecting each of a plurality of optical tests.

5 26. The process of Claim 24 further including, after said step of e) comparing said result, flagging said test for more frequent testing.

10 27. The process of Claim 19 wherein said test includes testing performed by at least one test equipment selected from a group including binary error rate measurement, spectrum analysis, insertion loss, return/reflectance loss, optical time domain reflectometer, chromatic dispersion, polarization mode dispersion measurement, power, and reflection.

15 28. The process of Claim 19 wherein said corrective action is selected from a group including sending a first message to a telephone, sending a first alarm to an alarm unit, sending a second alarm to a remote service, sending a second message to a remote service to request a response to a failure or risk of failure, grooming the optical network, and optically rerouting said channel.

29. A computer system for monitoring and testing an optical network, said computer system comprising:

a processor including:

20 an input component receiving an input from at least one test device;

an output component sending an output to a coupler switch for selecting an optical channel to test;

a storage component saving said input from said at least one test device, said input representing a test result; and

a processing component executing a process including determining a selected channel for testing, selecting said channel, initiating said test, storing said test result, determining if corrective action is necessary, and initiating said corrective action.

5       30. The method of Claim 29 wherein said output component communicates with a test switch for selecting one of a plurality of test equipment, and said process of said processing component includes selecting a test to perform.

10      31. The method of Claim 29 wherein said output component communicates with an alarm unit for providing an indication of the optical network status.

32. The method of Claim 29 wherein said output component communicates with a routing device for grooming and rerouting the optical network.

15      33. The method of Claim 29 wherein said corrective action is selected from a group including sending a first message to a telephone, sending a first alarm to an alarm unit, sending a second alarm to a remote service, sending a second message to a remote service to request a response to a failure or risk of failure, grooming the optical network, and optically rerouting said channel.

20      34. Computer readable media tangibly embodying a program of instructions executable by a computer to perform a method of monitoring and testing an optical network, said method comprising:

      a) determining a channel to test, said channel representing an optical signal on the optical network;

25      b) selecting said channel to test by sending a control signal to a coupler switch, said coupler switch communicating with a plurality of couplers, each of said couplers connected to an optical cable forming the optical network.

- c) initiating a test;
- d) saving a result of said test;
- e) comparing said result to at least one threshold;
- f) determining if a corrective action is required;
- 5 g) initiating said corrective action.

35. The method of Claim 34 further including a step of setting an amplification level for said channel to be tested, said amplification level applied to said channel before said step of c) initiating said test.

10 36. The method of Claim 34 further including setting an attenuation level for said channel to be tested, said attenuation level applied to said channel before said step of c) initiating said test.

37. The method of Claim 34 wherein said step of a) determining said channel to test includes sequentially selecting each of said channels.

15 38. The method of Claim 34 further including, after said step of e) comparing said result, flagging said channel for more frequent testing.

39. The method of Claim 34 further including, before said step of c) initiating said test, a step of selecting said test to perform on said channel.

40. The method of Claim 39 wherein said step of selecting said test includes sequentially selecting each of a plurality of optical tests.

20 41. The method of Claim 39 further including, after said step of e) comparing said result, flagging said test for more frequent testing.

42. The method of Claim 34 wherein said test includes testing performed by at least one test equipment selected from a group including binary error rate measurement, spectrum analysis, insertion loss, return/reflectance loss, optical time domain reflectometer, chromatic dispersion, polarization mode dispersion  
5 measurement, power, and reflection.

43. The method of Claim 34 wherein said corrective action is selected from a group including sending a first message to a telephone, sending a first alarm to an alarm unit, sending a second alarm to a remote service, sending a second message to a remote service to request a response to a failure or risk of  
10 failure, grooming the optical network, and optically rerouting said channel.